

## **REMARKS**

Claims 1-3, 5-16, 18, 19, 22-25, 45, 46, 52, and 221-241 are currently pending. By way of present response, claims 1, 16, 45, 221, 222, 224, 226, 227, 232, 233, 235, 237, 238, and 241 have been amended.

### **Claim Rejections - 35 U.S.C. § 112**

The Examiner has rejected claims 1-3, 5-16, 18, 19, 22-25, 45, 46, 52, and 221-241 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant has accordingly amended the claims as discussed below in order to comply with the definiteness requirement, and therefore respectfully requests withdrawal of the 35 U.S.C. § 112, second paragraph rejections.

#### **“extensive”**

The Examiner has rejected claims 1 and 45 stating the claims are indefinite because the term “extensive” is a relative term lacking proper comparative basis. Applicant has amended claims 1 and 45 to remove the relative term.

#### **“predominant” and “the predominant means”**

The Examiner has rejected claim 1 stating the claim is indefinite because the term “predominant” is a relative term lacking proper comparative basis, and because the term “the predominant means” lacks proper antecedent basis. Applicant has amended claims 1 and 45 to remove both terms.

#### **“the acoustic energy”**

The Examiner has rejected claim 1 stating the claim is indefinite because the term “the acoustic energy” in claim 1 lacks proper antecedent basis. Applicant respectfully

submits that proper antecedent basis is provided where the amended claim reads “wherein the first liquid is in contact with both the acoustic energy generator and the wafer, and *transfers acoustic energy* ...”

“substantive”

The Examiner has rejected claim 1 stating the claim is indefinite because the term “substantive” is a relative term lacking proper comparative basis. Applicant has amended claim 1 to remove the relative term.

“the associated risk”

The Examiner has rejected claim 1 stating the claim is indefinite because the term “the associated risk” lacks proper antecedent basis. Applicant has amended claim 1 to provide proper antecedent basis.

“the devices”

The Examiner has rejected claim 1 stating the claim is indefinite because the term “the devices” lacks proper antecedent basis. Applicant has amended claim 1 to provide proper antecedent basis.

“the sonic energy”

The Examiner has rejected claim 1 stating the claim is indefinite because the term “substantive” lacks proper antecedent basis. Applicant has amended claim 1 to replace the term “sonic” with the term “acoustic.”

“effectively”

The Examiner has rejected claims 222 and 233 stating the claims are indefinite because the term “effectively” is a relative term lacking proper comparative basis. Applicant has amended claims 222 and 233 to remove the relative term.

“relatively thin”

The Examiner has rejected claims 226 and 237 stating the claims are indefinite because the term “relatively thin” is a relative term lacking proper comparative basis. Applicant has amended claims 226 and 237 to remove the relative term.

**Claim Rejections - 35 U.S.C. § 102**

The Examiner has rejected claims 1-3, 5-11, 15, 19, 22,-25, 45, 46, 52, 224-226, 229-231, 235-237, and 239-241 under 35 U.S.C. § 102(e) as being anticipated by *Lorimer* (US Patent No. 6,460,552), citing the entire document, especially Figures 4, 6, 7a and the related description and columns 9-12. Claims 1 and 45 have been amended to include the limitation of flowing a processing liquid “from the second liquid dispense.”

Applicant teaches and claims an apparatus which comprises a first liquid dispenser for flowing a first liquid between an acoustic energy generator and a wafer, and a second liquid dispenser for flowing a process liquid from the second liquid dispenser and onto a device side of wafer. The apparatus taught and claimed by Applicant allows acoustic energy to be transferred from the acoustic energy generator to the first liquid, and to the non-device side of the wafer, through to the device side of the wafer, and then to the process liquid on the device side of the wafer.

It is Applicant’s understanding that *Lorimer* fails to disclose a liquid dispenser which flows a process liquid from the liquid dispenser. Instead *Lorimer* discloses an apparatus which applies filtered, high purity steam, which is a vapor and not liquid, to an active surface

of a wafer. Specifically, *Lorimer* discloses a workpiece cleaning system including “a vapor phase inlet positioned to apply a vapor phase at a first temperature to a first surface of the work piece.” See col. 4, lines 55-56. *Lorimer* does not disclose flowing a liquid from a liquid dispenser. The Examiner states that Applicant’s previous arguments distinguishing a liquid and vapor are not persuasive because:

- “the apparatus of *Lorimer* is capable of delivering a liquid”
- “the claims do not exclude delivering liquid as a vapor”
- “*Lorimer* teaches vapor rinsing, which is followed by drying. This means that at least some liquid is on the surface of the wafer during the process”
- “[t]he fact that *Lorimer* recommends filtering the liquid in a vapor state does not change the fact that the liquid is delivered to the wafer.”

However, the current state of the claims requires a liquid dispenser to dispense a liquid from the dispenser. ***Lorimer* only discloses a vapor phase inlet, not a liquid dispenser.**

As described in further detail in col. 10-11 of *Lorimer*, a steam inlet 84 within chamber 48 applies a vapor phase to an upper or active surface of the wafer while an aqueous or liquid phase is applied to the back surface 132 of the wafer 30. Then, “[t]he steam entering nozzle area 138 impinges on the wafer 30 near the center, **and is quickly condensed as it proceeds to toward the outer diameter by the relatively cool wafer.**” Col. 10, lines 33-37. Additionally, it is further disclosed that “[t]he steam is filtered in its gaseous phase, and then is applied to the active wafer surface via the inlet 146 of the chamber 48.” Col. 11, lines 54-56. Thus, it is clear that the steam entering the chamber 48 via inlet 46 is supplied in a gaseous phase, and that the gaseous steam does not condense and form a liquid until it strikes the cooler wafer surface. *Lorimer* does not disclose a second liquid dispenser nor a liquid dispensed from the second liquid dispenser. Therefore, it is irrelevant whether a liquid is eventually delivered to the wafer in *Lorimer*. Applicant requires a second liquid dispenser, and *Lorimer* requires a gaseous/vapor phase inlet. Applicant requires a liquid

flowing from the second liquid dispenser, and *Lorimer* requires a gaseous/vapor phase flowing from the gaseous/vapor phase inlet.

In addition, Applicant claims in dependent claims 16, 224, and 235 an apparatus comprising one or more acoustic wave transducers having a selected transparent frequency, which minimizes sonic wave reflections in the wafer and confers the additional benefits of improving the effectiveness of the clean and reduces power losses into the wafer. In contrast, *Lorimer* fails to disclose or suggest a transparent frequency, which minimizes sonic wave reflections in the wafer.

Applicant, therefore, respectfully requests removal of the 35 U.S.C. 102(e) rejections of claims 1-3, 5-11, 15, 19, 22,-25, 45, 46, 52, 224-226, 229-231, 235-237, and 239-241 and seeks an early allowance of these claims.

#### **Claim Rejections - 35 U.S.C. § 103**

The Examiner has rejected claims 12-14, 16, 18, and 228 under 35 U.S.C. § 103(a) as being unpatentable over *Lorimer* in view of *Busnaina* (WO 0021692). In view of the above remarks, a specific discussion of dependent claims 12-14, 16, 18, and 228 is considered to be unnecessary. Therefore, Applicant's silence regarding any dependent claim is not to be interpreted as agreement with, or acquiescence to, the rejection of such claim or as waiving any argument regarding that claim. Nonetheless, the following remarks regarding the Examiner's rejections may be helpful to expedite prosecution.

Applicant claims in dependent claim 16 (and 224 and 235) an apparatus comprising one or more acoustic wave transducers having a selected transparent frequency, which minimizes sonic wave reflections in the wafer and confers the additional benefits of improving the effectiveness of the clean and reduces power losses into the wafer. The Examiner relies on *Busnaina* stating the claimed operation frequencies were known as preferred for providing efficient cleaning, and that it would have been obvious to have the frequencies in order to achieve adequate cleaning in a relatively short time.

It is stated in MPEP 2144.05 section II(B) that “A particular parameter must first be recognized as a **result-effective variable**, i.e. a variable which achieves a recognized result, before the determination of **optimum or workable ranges** of said variable might be characterized as **routine experimentation**.” See *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977), where the prior art did not recognize that the treatment capacity is a function of tank volume to contractor ratio, and therefore the parameter optimized was **not recognized** in the art to be a **result-effective variable**, and therefore could **not be characterized as routine experimentation**.

Similarly, the prior art of record fails to recognize the **result** of using a **transparent frequency of 5.4 MHz**, to irradiate the backside of the wafer, which would pass through to the front side of the wafer to affect a superior clean. In contrast, *Busnaina* merely discloses a range of frequencies but fails to recognize the **unexpected result** of generating a **transparent frequency**. Therefore, the prior art of record does not recognize the claimed parameters as **result-effective variables**, and thus the **optimum or workable range** of the claimed parameters **cannot be characterized as routine experimentation**.

Applicant, accordingly, respectfully requests withdrawal of the rejection of claim 16 under 35 U.S.C. § 103(a) as being unpatentable over *Lorimer* in view of *Busnaina*.

The Examiner has rejected claims 221-223, 227, 232-234, and 238 under 35 U.S.C. § 103(a) as being unpatentable over *Lorimer* in view of *Puskas* (US Patent No. 6,036,785), *Hyamizu* (US 20020157685) and *Ferrell* (US Patent No. 6,313,565), stating it would have been obvious to an ordinary artisan at the time the invention was made to provide transducers operating in different frequencies in the apparatus of *Lorimer* in order to enhance the cleaning action of the apparatus with reasonable expectation of success because *Puskas* and *Ferrell* recommend such. In view of the above remarks, a specific discussion of dependent claims 12-14, 16, 18, and 228 is considered to be unnecessary. Nonetheless, the following remarks regarding the Examiner’s rejections may be helpful to expedite prosecution.

Applicant claims in claims 221-223 and 232-234 an apparatus which comprises a plurality of acoustic wave transducers which are capable of **simultaneously** transmitting a **plurality** of frequencies.

It is Applicant's understanding that *Hayamizu* discloses an ultrasonic washing method in which two frequencies may be sequentially applied to a wafer, but not simultaneously. It is Applicant's understanding that *Ferrell* discloses a method for removing chemical residues in which multiple transducers operate at a single frequency, but not at a plurality of frequencies. It is Applicant's understanding that *Puskas* discloses a **bath cleaning system** which generates a plurality of non-overlapping frequencies in liquid 22 which is contained in a **tank 20**. The bath cleaning system of *Puskas* cleans wafers in an entirely different manner than the spinning single wafer cleaning system of *Lorimer*. In addition, the transducers 17, 18, and 19 of *Puskas* are attached to the tank frame 20 (see Figure 1A). Applicant respectfully submits that the art of record does not teach, and one of ordinary skill in the art would not be motivated, to alter the single wafer cleaning apparatus of *Lorimer* to include the multiple transducers from the bath cleaning system of *Puskas*. Further, because the systems are entirely different in their modes of operation, there would be no reasonable expectation of success in the proposed combination. *Puskas* is entirely void of the concept of attaching transducers to a platter. Applicant, therefore, respectfully requests removal of the 35 U.S.C. 103(a) rejections of claims 221-223 and 232-234.

Pursuant to 37 C.F.R. 1.136(a)(3), applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully submitted,

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